

Species: *Carex limosa* L.

Common name – mud sedge

Status: Table 1 summarizes the current status of this plant by various ranking entities and defines the meaning of the status.

Table 1. Current status of <i>Carex limosa</i>		
Entity	Status	Status Definition
NatureServe	G5	G5 - Globally secure - Common, widespread, and abundant. Perpetually secure under present conditions. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
Colorado Natural Heritage Program (CNHP)	S2	S2 - State imperiled - Imperiled because of rarity or because of some factor(s) making it very vulnerable to extirpation or extinction. Typically 6 to 20 occurrences or between 1,000 and 3,000 remaining individuals.
USDA Forest Service	None	
USDI Fish and Wildlife Service	Not listed	Not federally recognized under the Endangered Species Act (ESA) as endangered, threatened, proposed, or candidate species.

The 2012 U.S. Forest Service Planning Rule defines Species of Conservation Concern (SCC) as “a species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area” (36 CFR 219.9). This overview was developed to summarize information relating to this species' consideration to be listed as a SCC on the Rio Grande National Forest, and to aid in the development of plan components and monitoring objectives.

Distribution, abundance, and population trend on the planning unit:

Carex limosa is widely distributed at higher latitudes throughout the northern hemisphere. In North America is in found in 30 states, from Alaska to as far south as Colorado and Nebraska. Although it is broadly distributed, occurrences outside of boreal regions are typically uncommon or rare (Gage and Cooper 2006).

In Region 2, this obligate wetland species occurs primarily in subalpine fens formed in small basins in the mountains of Wyoming and Colorado. A limited number of occurrences are also documented from the Nebraska Sandhills region. In Region 2 it has been found in fens ranging from 6,600 to 11,643 feet (Gage and Cooper 2006).

There are two historical CNHP element occurrence records of *Carex limosa* in the planning area. The occurrences were reported in 1945 and have not been relocated. There is no data pertaining to the size or condition of the occurrences. There are 17 additional occurrences reported in Colorado outside the planning area (CNHP 2015).

Gage and Cooper (2006) report that there are no reliable region-wide population estimates available for *Carex limosa*.

USFS Corporate Database Habitat Type Associated with the Species:

Carex limosa is a fen-obligate species; the Land Type Associations GIS data does not identify fens. Mapping the fens on the planning unit would help identify how much habitat is available for this species on the planning unit.

CNHP Ecological System of the Southern Rocky Mountains Ecoregion:

In their analysis of Ecological Systems in Region 2, Comer et al. (2003b, as reported in Gage and Cooper 2006) described a *Carex limosa* seasonally flooded herbaceous alliance as occurring in two ecological systems: the Rocky Mountain Subalpine Montane Fen herbaceous wetland ecological system (CES306.831) and the Rocky Mountain Alpine-Montane Wet Meadow herbaceous wetland system (CES306.812). These systems occur infrequently throughout higher elevations in the Rocky Mountains where certain hydrologic, geomorphic, and climatic factors are present.

Brief description of natural history and key ecological functions:

Carex limosa is a perennial sedge found mostly commonly in fens formed in small lake basins or depressions. These are often, but not always, associated with glacial activities. Generally, *Carex limosa* occupies the wettest, non-aquatic microsites, which can include pools, hollows, or floating mats. Basin size is an important variable influencing hydrology and vegetation, with floating mat *C. limosa* communities most commonly developing in larger and deeper basins. Since *Carex limosa* is typically found in floating mat environments, which represent a finite stage in the terrestrialization of many basins, it may be thought of as a mid-seral species. However, because a trademark characteristic of fens is their high hydrologic stability and low frequency of disturbance, *C. limosa* may remain a viable component of plant communities for thousands of years. *Carex limosa* is nearly always found in open, unshaded sites. This suggests that *C. limosa* may be unable to effectively compete with other larger sedge species and is only an effective competitor in the extremely wet microsites in which it is typically found (Gage and Cooper 2006).

Carex limosa is a clonal species spreading largely via underground rhizomes or elongate stoloniferous stems. Its root systems are highly interconnected. Because of its clonal habit, definition and field identification of genetically distinct individuals is difficult, as the culms comprising a particular stand

may be composed of any number of genetically identical clones (Gage and Cooper 2006). This key aspect of its life history needs to be taken into account during any population estimates.

Little is currently known about population demographics in *Carex limosa*, however, some information can be derived from research conducted on other clonal sedge species. It's believed that the average age of *Carex limosa* genets (genetically distinct individuals) could be decades or even millennia because of the species' capability for vegetative growth. As the clone expands, the connections linking different portions of the clone can be severed, with what was once one clone becoming multiple clones.

Overview of ecological conditions for recovery, conservation, and viability:

The ecological systems that support *Carex limosa* occur infrequently throughout higher elevations in the Rocky Mountains where certain hydrologic, geomorphic, and climatic factors are present. Like a number of wetland species in the region *Carex limosa* was likely more widespread than it is at present. Expansion of the species, at least under current and predicted climate scenarios appears highly unlikely due to limited habitat and potentially low dispersal distances. Consequently, management goals need to include explicit protections for fens (Gage and Cooper 2006).

Although direct impacts currently appear to be of little consequence to most Region 2 *Carex limosa* occurrences, impacts from a wide variety of activities are known to indirectly impact wetland structure and function, with potential implications for the species. Since fens are supported primarily by groundwater inflows, any activity that significantly alters the water or sediment yield from surrounding watersheds, such as logging or road construction, can deleteriously affect wetland vegetation. Climate change also has the potential to negatively impact fens by altering their hydrologic balance, and increasing decomposition rates enough to shift the system from one which accumulates peat to one that gradually loses it. Because *C. limosa* is typically found on floating peat mats that are able to rise and fall with fluctuating basin water levels, it may be relatively resistant to small changes in water levels resulting from climate change or altered water and sediment inflows due to changes in basin vegetation cover (Gage and Cooper 2006).

Gage and Cooper (2006) found no evidence to suggest that the persistence of *Carex limosa* within Region 2 is presently threatened. Data from the relatively small proportion of sites that have received study suggest that occurrences are stable. However, since few sites supporting *C. limosa* have been studied in detail, evaluating trends for other occurrences in the region is impossible. As stated earlier, there is no data for the two historical occurrences in the planning area.

Key ecosystem characteristics and ecological conditions for recovery, conservation, and viability:

There are two historical occurrences of this species on the RGNF, those two occurrences were reported in 1945 and have not been revisited. Because *Carex limosa* is a fen-obligate species protecting the fens it depends on is a critical step in its conservation.

The RGNF should strive to maintain habitat conditions for *Carex limosa* by applying suggested management practices as follows:

- 1) Map habitat – Mapping the fens in the planning area would be a key step in identifying possible habitat for this species in the planning area.

- 2) Manage known habitat - Known fens need to be protected and pressures from any management influences found to be creating unacceptable impacts need to be adjusted. Since fens are supported primarily by groundwater inflows, any activity that significantly alters the water or sediment yield from surrounding watersheds, such as logging or road construction, can deleteriously affect wetland vegetation.
- 3) Manage environmental stressors - Continue assessing the RGNF's contribution to global climate change and adjust actions where permissible within the Forest Service's legal and regulatory authority. Use tools such as the Forest's Climate Change Scorecard to assess impacts and make positive changes where needed. Gage and Cooper (2006) state that climate change has the potential to negatively impact fens by altering their hydrological balance and increasing decomposition rates enough to shift the system from one which accumulates peat to one that gradually loses it.

Key uncertainties and information needs/gaps:

There are a large number of information gaps and research needs for this species. The following suggestions are ordered from inventory activities (to determine the current status) to more complex biological studies (to help understand the species):

- Re-visiting and detailed mapping of the known occurrences
- Broad-scale fen inventories are needed to better understand the abundance, distribution, and functional diversity of these ecosystems on the Forest. These studies also provide a useful framework for more fine-scaled investigations of fen hydrology, vegetation, and geochemistry, which represent the primary variables driving fen structure and function.
- Addressing any imminent threats to fens, and developing a fen management strategy to protect these ecosystems
- Demographic studies and extensive population monitoring are needed to improve our understanding of the species

The following is an outline of a monitoring approach that could be used to inform the development of the RGNF Forest Plan revision's monitoring plan. Additionally, areas of research opportunity (beyond the scope of the Forest Plan revision) are suggested below based on key uncertainties about this species.

- 1) Monitoring: monitoring priority is a judgment determination based on number of occurrences, potential threats, and conservation status. The priority for this species is thought to be moderate. This is primarily due to the status being G5S2 (see Table 1) and very limited occurrences on the RGNF. Existing management practices are not known to be causing detrimental impact. Thus, monitoring is suggested as follows:
 - a. Map the fens on the Forest and conduct a species inventory. Ensure that additional occurrences, as well as negative search results, are recorded in the appropriate electronic database. Additional occurrences increase the odds in the confidence of assessing

population viability, especially with greater geographic separation. Finding additional occurrences helps inform whether additional monitoring is needed and at what intensity.

- b. Relocate and monitor the known element occurrences to document presence or absence. Evaluate each occurrence based on appropriate database protocols. Visually document the same populations every 5-7 years (twice in a planning cycle). Consider enlisting an organization such as CNHP to help develop a rapid monitoring technique that is meaningful for trend analysis but is easy to establish and simple to evaluate.
- 2) Research:
- a. More studies of the demographics of *Carex limosa* and extensive population monitoring are needed.

Key literature:

Colorado Natural Heritage Program (CNHP). 2005. Ecological System Descriptions and Viability Guidelines for Colorado. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado.

Colorado Natural Heritage Program (CNHP). 2015. Element Occurrence Records for the Rio Grande National Forest. Unpublished data on file at the Supervisor's Office for the Rio Grande National Forest. Monte Vista, Colorado. Data compiled 2/2015.

Gage, E. and D.J. Cooper. 2006. *Carex limosa* L. (mud sedge): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: <http://www.fs.fed.us/r2/projects/scp/assessments/carexlimosa.pdf> [Oct 13, 2015].

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://explorer.natureserve.org>. (Accessed: September 28, 2015).

USDA Natural Resource Conservation Service (NRCS). 2015. The PLANTS Database (<http://plants.usda.gov>, 28 September 2015). National Plant Data Team, Greensboro, NC 27401-4901.

Map of Known Occurrences:

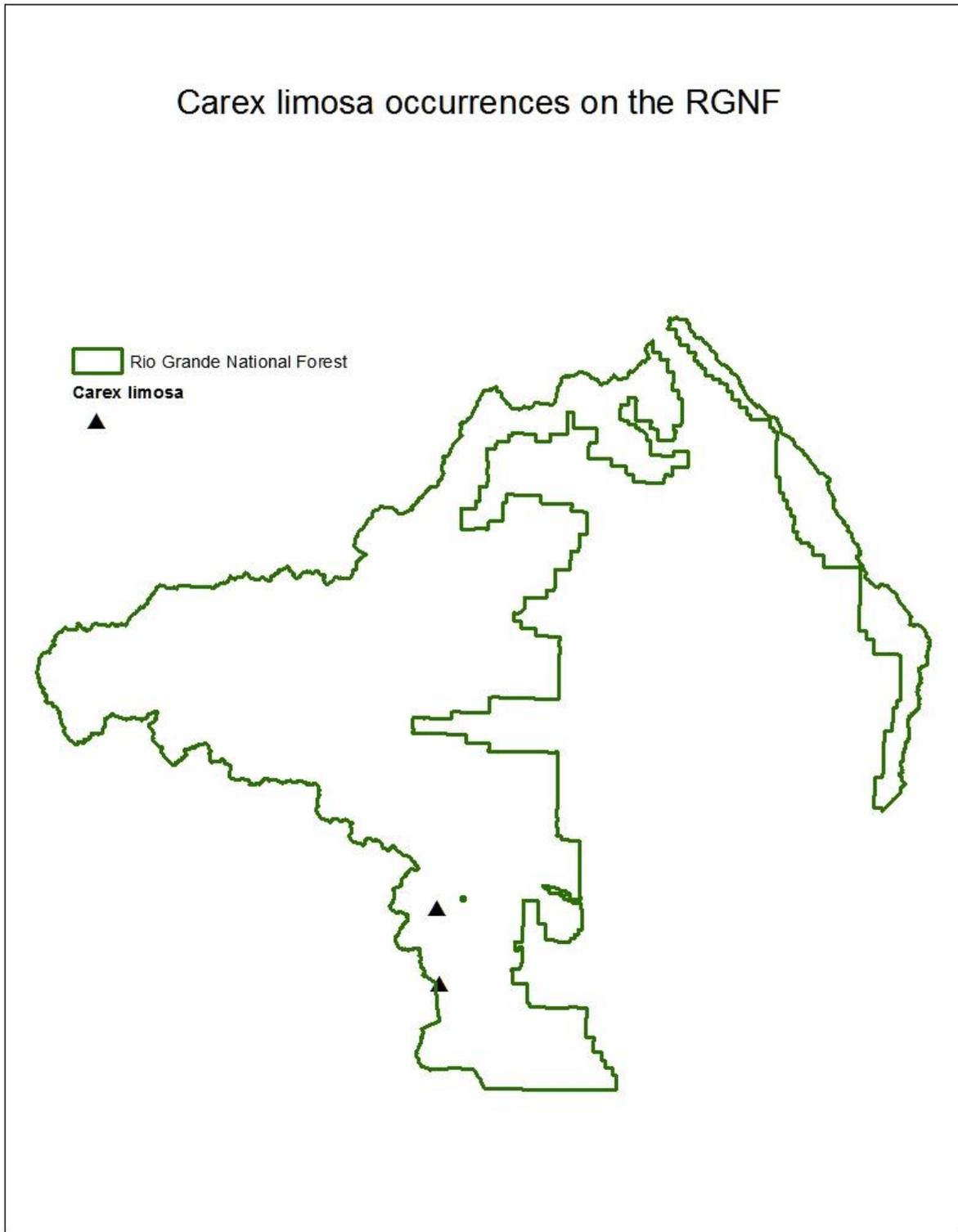


Figure 1. *Carex limosa* occurrences on the RGNF.